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U. S. DEPARTMENT OF AGRICULTURE.
BUREAU OF PLANT INDUSTRY—BULLETIN NO. 7.
B. T. GALLOWAY, Chief of Bureau.

THE ALGERIAN DURUM WHEATS:

A CLASSIFIED LIST, WITH DESCRIPTIONS.

BY

CARL S. SCOFIELD,
EXPERT, BOTANICAL INVESTIGATIONS AND EXPERIMENTS.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1902.

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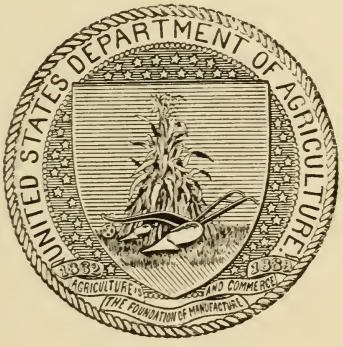

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1902.

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Plant Industry,
Office of the Chief,
Washington, D. C., November 8, 1901.

Sir: I have the honor to transmit herewith a paper by Mr. C. S. Scofield, entitled The Algerian Durum Wheats, and respectfully recommend that it be published as Bulletin No. 7 of this Bureau. The paper was prepared in connection with the Botanical Investigations and Experiments and was submitted by the Botanist.

Respectfully,

B. T. Galloway,
Chief of Bureau.

Hon. James Wilson,
Secretary of Agriculture.

Withdrawn
FEB 7 '40

PREFACE.

In the act making appropriations for the Department of Agriculture for the fiscal year 1902, under the head of "Botanical investigations and experiments," authority is given—

To investigate the varieties of wheat and other cereals grown in the United States or suitable for introduction, in order to standardize the naming of varieties as a basis for the experimental work of the State experiment stations and as an assistance in commercial grading, and to investigate, in cooperation with the Bureau of Chemistry, the causes of deterioration of export grain, particularly in oceanic transit, and devise means of preventing losses from those causes.

The work thus authorized falls under two heads, a purely botanical investigation of the varieties of cereals and a general investigation of the methods of grading and shipping export grain. Both lines of inquiry have been placed in charge of Mr. Carl S. Scofield.

From October, 1900, to July, 1901, Mr. Scofield was in Algeria and western Europe, engaged in work on cereals, and devoted about three months to the study and introduction of the Algerian durum wheats, a work suggested and supervised by Mr. W. T. Swingle of the Department of Agriculture. These wheats form an important export from Algeria to Europe for use in the manufacture of macaroni, and their recent introduction into American agriculture by this Department makes it important that the agricultural experiment stations as well as private experimenters and investigators, including progressive manufacturers and farmers, should have a precise understanding of the characteristics of the important varieties. If it shall later be found that a particular variety of Algerian durum wheat—for example, Pelissier—is notably successful in this country because of its productiveness or the superior adaptation of its gluten to macaroni making, that variety will then be known everywhere by that one name and experimenters and farmers will not be subjected to the great waste of time and money that follows when the same name is loosely applied to two or three or half a dozen varieties that have very different qualities.

For the general plan of this publication Mr. Scofield desires to acknowledge his indebtedness to the "Catalogue Méthodique et Synonymique des Froments," by M. Henry L. de Vilmorin, with additional thanks to M. Philippe de Vilmorin for many kind suggestions and the opportunity of visiting the large collection of wheats at Verrières.

The work for the publication was done chiefly in the laboratories of Dr. L. Trabut, "Chef des Services Botaniques de l'Algérie," who very kindly not only gave Mr. Scofield the free use of his laboratories, photographic apparatus, and herbarium, including one of the best existing collections of durum wheats with his notes thereon, but also gave much attention and personal interest to the work, for which the author feels the deepest gratitude, and without which the work could scarcely have been accomplished.

FREDERICK V. COVILLE,
Botanist.

OFFICE OF THE BOTANIST,
Washington, D. C., November 6, 1901

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THE ALGERIAN DURUM WHEATS: A CLASSIFIED LIST WITH DESCRIPTIONS.

INTRODUCTION.

Owing to the great variability of the wheat plant, due in part to its high development and the artificial conditions of its culture, its varieties are extremely difficult to classify. In fact, any attempt to list and describe all existing types of wheat would be an endless task; for almost all imaginable types can now be found or are liable to be produced. Of all the existing forms, comparatively few are of sufficient economic value to find a place in general culture, so that a practical systematic account of varieties for the use of the plant breeder and variety tester can be made by describing as accurately as possible the forms now prominent, leaving place for new ones that may appear, and claiming to be final only in the insistence that one name shall be connected solely with one variety, thus avoiding confusion and misunderstanding in the literature of the subject and in commercial dealings.

OBJECT OF A DESCRIPTIVE CLASSIFICATION OF WHEAT VARIETIES.

An accurate and detailed description of wheat varieties, with a classification based thereon, may be so used as to have a harmful as well as a beneficial result. The important point in a variety is that it yield the largest possible amount of grain of the best quality for the purpose desired under given conditions. The ability to do this is not always indicated by the morphological characteristics of the plant. Plants growing together under the same conditions do not all vary alike. Certain ones find peculiar conditions more congenial and develop more vigorously, so that after a few generations the plants which succeed best naturally replace the others, unless artificial selection interferes. A variety produced in one locality might be made up of plants having certain well-marked similar points. Under different conditions some of these plants might change in a certain respect, and others remain nearly constant with regard to this particular point. Some of the plants which change might find the new conditions better adapted to their growth and gradually replace the others which might be considered to be of the true type. Were artificial selection to be used here in such a way as to discriminate against the better-yielding

plants, for example, it would be used with harmful effect. In other words, a minute botanical description unless used wisely is quite as likely to be harmful as useful. The possibility of this is, however, small in comparison with the possibility of usefulness in an accurate description and classification of varieties of wheat. The confusion and misunderstanding resulting from a lack of accurate knowledge of the varieties for which names are used are very great. There can be but little object in giving a variety a name, unless a definite record or description is available that will make the name mean something. It is at present not an uncommon thing to find two or more names applied to a single variety of wheat, or to find a single name applied to several distinct varieties. A simple and accurate description would do much toward preventing such a condition of affairs.

In many cases where large numbers of closely allied varieties are on trial under similar conditions, there are few clean-cut morphological distinctions that can, with our present limited knowledge of the plants, be stated. The only difference noticeable often is in yielding capacity. This, of course, must be observed and put on record. It is not to be expected that a method of description, however accurate, can ever replace the pedigree method of recording varieties; but it is hoped that such a description may supplement the records and help to simplify them and to avoid errors.

Since a change in conditions of soil and climate causes variation in botanical characteristics, as well as in the yield and quality of the grain of the wheat plant, it is impossible to correctly describe varieties gathered from widely different sources after they have been grown for several generations in one place under nearly the same conditions. The aim should rather be to describe a variety as growing under the conditions where it reaches the best development, when it may also be possible to add to the description of its botanical form certain sharply defined chemical characteristics of the grain. It now seems possible to outline methods of description that will meet this purpose, and this will render unnecessary the collection of varieties from various localities for comparison side by side and the study of the variations induced by the incident change of conditions.

The laws of variation in wheat due to climate, food supply, and hybridization are not yet well enough known to permit the use of a system of classification which is not more or less arbitrary. Natural relations and affinities are often hard to trace, and it seems better to start with some practical system, however arbitrary, and then rearrange the classification as rapidly as the data for doing so are obtained.

BASIS OF PRESENT DESCRIPTIONS AND CLASSIFICATION.

The varieties of wheat belonging to the botanical species *Triticum durum* make up the class known in the United States as "goose" or "rice" wheats. These names are applied on account of the horny

texture of the kernel, which shows little or none of the starchy, white appearance in cross section that is found in the grain of varieties of *Triticum æstivum*, a species more commonly known as *Triticum vulgare*, to which most of our commonly cultivated wheats belong. The durum varieties as a class differ further from the vulgare varieties in that they are, so far as known, all bearded, and the beards are particularly strong and stiff. Also, the midrib or keel of the outer glumes is always prominent in the durum varieties and extends the entire length of the glume.

The present classification is based on differences observable in the head and grain. There are doubtless valuable characters to be made out from a study of the leaf and stem; and the time of ripening and general color of the plant are also points of great importance. As these grounds of distinction, however, were not available in case of some of the varieties here considered, they are not used at all in the present work.

STRUCTURE OF THE WHEAT HEAD.

The flowering and fruiting cluster at the summit of the stem of a wheat plant is called indifferently the "head" or "spike." The portion of stem running through the spike, on which the flowers or kernels are borne, is called the "rachis." The rachis is divided by a number of joints or "nodes," and at these nodes on alternate sides of the rachis are attached the "spikelets," i. e., the several small secondary spikes which, together with the rachis, make up the spike proper. The short branch running through each spikelet is known as the "rachilla." Inserted upon the rachilla are several concave scales which are called the "glumes." The two lowest and outermost of these contain no flowers or kernels, and are designated as the "flowerless glumes." Above these, arranged alternately, are borne the flowers—rarely less than two or more than five. Each flower, and as it matures, each grain, is subtended by a single glume, known as the "flowering glume." Each flowering glume has a longitudinal nerve, which at the summit extends into a prominent "awn" or "beard." On the inner or creased side of the grain or "berry," filling it very closely and more or less hidden from view by the flowering glume, is borne the "palea" or "palet," a thin scale with two nerves. The flowerless and flowering glumes and the palets are spoken of collectively as the "chaff."

The outer or flowerless glumes in all varieties of *Triticum durum* have a prominent midrib or "keel" extending from the base to the tip, terminating in a "beak" of varying length and thickness. The rachis often bears rather long, stiff hairs about the base of the rachilla, but these should not be confused with the short, soft hairs often borne on the surface of the outer glumes. It is the latter that are referred to when the term "hairy chaff" is used.

The spike in varieties of *Triticum durum* is often symmetrical to one longitudinal plane only, i. e., to a plane separating the rows of spikelets. This single longitudinal symmetry is shown in Plate I, where three spikes of the same variety (Pelissier) are shown in different positions. It is readily seen that in *a* the bases of the spikelets overlap much more than in *c*, which is the opposite side of a similar spike. For convenience, the view shown in *c* is called the front view, that in *a* the back view, and that in *b* the side view. When the condition shown in Plate I, *c* is slightly more pronounced, the rachis is readily visible in the front view, as, for instance, in Plate XVII, figure 1. This monosymmetry, which is due to the bases of the spikelets overlapping more on one side than on the other, is often attended by a curvature of the spike, the side seen in the front view being the concave one.

GRAIN CHARACTERS.

The grain of wheat by its differences in shape, size, and color offers points of distinction that are very clear, and these used in connection with the characters furnished by the spike and spikelet afford ample means for definite description and reasonably extended classification. The grain of durum wheat varies in color from whitish amber to dark red. It may be clear, i. e., almost translucent, or dull, i. e., quite opaque. It also varies widely in its general size and shape. (See Plate III, fig. 2.)

There are decided differences in both the quality and the quantity of the nitrogenous material contained in the grain, and these differences are reasonably constant within the variety under given conditions. They are approximately stated when the color and the quality, as determined by the general appearance, are given. It is probable that in time chemical methods will be devised by which it will be possible to express quality of wheat in accurate figures, "quality" meaning quantity of nitrogenous material and relative amount of its important constituents. The quality of a variety stated in these terms would determine for what use it is best fitted and its approximate value for that use.

RELATIVE VALUE OF CHARACTERS.

The general appearance of the spike or of the grain of a wheat variety is one of the things that fixes it in mind. Accurate description is only the analysis of the general appearance to its simplest details and a statement of these details. Varieties may then be separated into groups on the basis of this description, these groups again split, and so on until the limit, which is the single variety, is reached. This separation is made arbitrarily, using what appear to be the most important and constant details first. There is often some uncertainty or difference of opinion as to which are the most important and con-

THREE SPIKES OF DURUM WHEAT, VARIETY PELISSIER, IN DIFFERENT POSITIONS.

HELIOTYPE CO., BOSTON.

stant characteristics. For instance, it is generally assumed that the distinction between a smooth and a hairy chaff is reasonably important and constant, but in the case of the variety "Pelissier" it is difficult to say to which class it really belongs. It is possible that this is a case of two varieties approaching similarity in all points but that of pubescence. It is more probable, however, that it is a case of extreme variability in this particular. Other equally ambiguous cases arise, but it is believed that sufficient accuracy of description and reproduction have been secured to be of substantial assistance to those who deal with these varieties in variety testing or improvement, or in a commercial way.

GLOSSARY OF TERMS USED.

(For illustrations see Pls. II and III.)

AURICULATE.—Eared. Applied to the summit of the flowerless glumes when the wings are extended upwardly in earlike form. See Shoulder.

BEAK.—The projecting tip of the keel of the flowerless glumes, which, though sometimes prominent, never becomes long enough to be called a beard.

BEARD, BEARDED.—The beard consists of the long, stiff awns borne at the tips of the flowering glumes.

BREADTH.—As applied to the head or spike, the approximate measurement of the width of the head, exclusive of beards, taken across both rows of spikelets in the view in which the heads are shown in the cuts.

BRUSH.—The hair found on the upper end of the grain.

CHAFF.—Collective term for the flowerless and flowering glumes and the palets.

DURUM.—Used to indicate the varieties of wheat belonging to the species *Triticum durum*. The same term may be used in commerce to distinguish these wheats, which are best for the manufacture of macaroni, from the "vulgare" wheats, which are best for bread-making purposes.

FLAT.—A spike is said to be flat when its breadth is considerably greater than the width of a single spikelet, i. e., when the breadth of the spike conspicuously exceeds its depth.

GLUME.—One of the concave scales of the spikelet. The empty pair at the base of the spikelet are the "flowerless glumes." The remainder, containing flowers or grains, are called the "flowering glumes."

HAIR, HAIRY.—Used with reference to the pubescence which is sometimes present on the glumes, chiefly on the outer or flowerless ones. Terms not to be confused with beard and bearded, and as here used not applied to the hairy growth often found on the rachis at the base of the spikelet.

HEAD.—Same as spike.

KEEL.—The prominent rib extending from the base to the tip of the flowering glumes on the back.

LENGTH.—As applied to the head or spike, the measurement from the lowest node to the tip of the glume of the terminal spikelet.

PALEA, PALET.—The thin, two-nerved scale on the inner or creased side of the berry. Seldom referred to in the descriptions.

SHOULDER.—As applied to the outer glume, denoting the wing on each side of the beak, which often forms an earlike (auriculate) projection. (See Plate II, fig. 2.) Descriptions using this term can be only relative or comparative, because of the variation in the same head, the shoulder being narrower and the auriculation less pronounced in the spikelets near the base than in those toward the apex of the spike; but this difference is reasonably constant within the variety.

SMOOTH.—As applied to the glumes, this means simply not hairy.

SPIKE.—The flowering or fruiting cluster at the summit of the stem.

SPIKELET.—One of the short branches of the spike with its glumes and palets and flowers or kernels.

VULGARE.—Used to designate all varieties of wheat belonging to the species best known as *Triticum vulgare*, but according to the revised nomenclature properly called *Triticum aestivum*.

GENERAL CHARACTER OF THE DURUM WHEATS.

The present work deals with some of the more important varieties of *Triticum durum* now grown in a general or experimental way in Algeria, North Africa.

The soil and climate of the tillable portion of Africa north of the Sahara Desert are favorable to the production of durum wheats, which, though not containing as large a quantity of nitrogenous material as the similar wheats of Southern Russia, still furnish a quality of this material so well adapted to the manufacture of macaroni and similar paste foods that the product in quality rather excels that derived from the Russian varieties. It may be well to say here that commercially the chief use of the durum wheats is for the manufacture of paste foods. For this purpose it is necessary to have a gluten decidedly different in character from that desired for bread-making purposes. Bread is, however, made extensively from flour of durum wheat in countries where this is almost the only wheat grown.

The bread thus made is usually darker in color and heavier and tougher in texture than that made from flour of vulgare wheats, but has a very pleasant flavor and is considered highly nutritious, since durum wheats as a rule contain more proteid matter than vulgare wheats.

Certain peculiar variational tendencies are found in common among the varieties of North African durums. In case of varieties having colored chaff and beards the color becomes more pronounced as they are grown where the sunlight is more intense and the relative humidity of the atmosphere is less, and in general the quality of the grain improves as the intensity of the sunlight increases and the relative humidity of the atmosphere decreases. There is considerable variation as to rust resistance among the varieties of durum wheat, but they will probably average more rust-resistant than the varieties of *Triticum aestivum*. This is due in part to their vigorous growth and to the fact that they find their highest development in climatic conditions unfavorable to the growth of rust.

They are, however, somewhat subject to attacks of smut (*Ustilago tritici*); not more so probably than the vulgare wheats, but enough so that a fungicide treatment is usually given to the seed wheat in Algeria, particularly in the province of Constantine.

The varieties of durums so far grown in the United States have proved better yielders under semiarid conditions than the vulgare wheats. Algerian varieties of durum wheats are always grown with autumn planting, but it is probable that most of these varieties will succeed with spring sowing in the northern portion of the Mississippi Valley. The yield and rust resistance will be determined largely by the time of ripening of the different varieties.

It is to be hoped, since durum wheat is likely to be more generally distributed and more widely grown in the near future in the United States, that the men who grade and handle grain may learn to know it readily and that they will give it a distinct place in the general system of grades, so that there will be no necessity for the grower to mix it with vulgare wheat in order to sell it, thus greatly lowering the value of both sorts, since they are difficult to separate and are of much less value when mixed.

The places in the United States where durum wheats are likely to grow best are the somewhat dry yet tillable portion of the Great Plains west of the Mississippi River and the Red River of the North and the irrigated region of the Southwest.

The chief use of this wheat will be for the manufacture of macaroni and similar paste foods, for it is the only wheat with which a first-grade article of this class can be made. For the manufacture of breakfast foods its high proteid content and its pleasant flavor are likely to recommend it, and it will find a limited use in affording a cheap but nutritious bread in localities where its increased yield will make it cheaper than vulgare wheat.

EXPLANATION OF PLATE II.

Figure 1 represents a spikelet of the variety Beliouni magnified six times. This shows the smooth chaff with the cluster of hairs on the portion of the rachis just below the spikelet. The long, slender beak is shown extending well beyond the tip of the flowering glume. The shoulder of the outer glume is fairly prominent in this view and is sharply auriculate. The prominent keel of the outer glume can be seen only near the base and tip, the middle being out of view.

Figure 2 shows a spikelet of Mohamed ben Bachir with hairy chaff, magnified as above. This spikelet is much narrower than the preceding one, containing but three grains. The beak is very short, not reaching the tip of the flowering glume. The shoulder of the outer glume is very broadly auriculate, and the deep indentation separating the beak and auricle is shown in the glume at the extreme left.

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FIG. 1.

FIG. 2.

SPIKELETS OF DURUM WHEATS: FIG 1, BELIOUNI; FIG. 2, MOHAMED BEN BACHIR.

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EXPLANATION OF PLATE III.

Figure 1 shows the two flowering glumes with the mature grain, subtended by the outer flowerless glume, as seen in the variety Moroccain, magnified six times. The chaff is smooth; the beak of the keel is of medium length, but does not pass the tip of the flowering glume. The shoulder of the outer glume is narrow and shortly but sharply auriculate. Of the chaff the inner scale (palea) fits closely about the grain, and with it is held snugly within the flowering glume when in normal position. Only the flowering glumes ever bear a long awn or beard, and this in the cut is broken off.

Figure 2 shows two varieties of grain magnified six times. The longer grains are those of Nab el Bel, which are described as being long and slender, and the others are from Meskiana and are short and broad. The side view of the longer grain shows a curvature in the outline. This is sometimes very pronounced, and from this shape of the grain the variety gets some of its names.

The hair visible on the upper end of the grain is "the brush." It is usually less abundant in the durum than in the vulgare wheats.

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG. 1, PART OF SPIKELET OF MOROCCAIN; FIG. 2, GRAINS OF NAB EL BEL AND MESKIANA.

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DESCRIPTION OF VARIETIES WITH KEY.

This key is intended to serve as a guide in placing a variety near where it belongs. It is constructed on a dichotomous system, which separates the subject matter into classes on the basis of sharp differences in the particular aspect chosen as the ground of comparison. The figure on the right in each case refers to the same figure on the left of the page where the next division is made.

1	Spikes straight, or nearly so; rachis concealed by the overlapping bases of the spikelets; chaff either smooth or hairy; grain either red or amber	2
	Spike more or less curved; rachis nearly or quite exposed on the concave side; grain amber; chaff white, or nearly so	27
2	Chaff smooth, i. e., not pubescent	3
	Chaff more or less hairy	16
3	Grain amber	4
	Grain red	15
4	Chaff white, or nearly so	5
	Chaff strongly colored	11
5	Beards white or straw-colored	6
	Beards nearly or quite black	*Pelissier.*
6	Beak of keel two to four times as long as broad	7
	Beak of keel five or six times as long as broad	10
7	Beak distinctly passing tip of flowering glume	8
	Beak scarcely reaching tip of flowering glume	9
8	Spikes about 1.2 cm. broad; spikelets bearing three or four grains	*Aicha el Beida.*
	Spikes about 1 cm. broad; spikelets bearing two or three grains	*Poulot.*
9	Spike about the same size from base to tip; shoulder of outer glume very slightly auriculate	*Beloturka.*
	Spike tapering from base to tip; shoulder of outer glume sharply auriculate	*Courtellement.*
10	Shoulder of outer glume broad; not sharply auriculate; grain short and broad	*Xeres.*
	Shoulder of outer glume narrow; sharply auriculate; grain long and slender	*Moroccain.*
11	Chaff red; beards brown or black	12
	Chaff and beards black	14
12	Spike tapering from base to top; beards somewhat deciduous	*Medeah.*
	Spike about the same size from base to tip; beards vigorous and well retained	13
13	Spikes about 1.2 cm. broad; spikelets bearing three or four grains; shoulder of outer glume broad, sharply auriculate	*Beliouni.*
	Spikes about 1 cm. broad; spikelets bearing usually two grains; shoulder of outer glume very narrow, slightly auriculate	*Paros.*
14	Spike about 8 cm. long; grain clear, dark amber	*Kahla.*
	Spike about 6 cm. long; grain dull, whitish amber	*Caïd de Siouf.*
15	Spike about 0.8 cm. broad; beak of keel five to six times as long as broad; shoulder of outer glume narrow, distinctly auriculate	*Trimenia.*
	Spike about 1.1 cm. broad; beak of keel three or four times as long as broad; shoulder of outer glume broad, not sharply auriculate	*Hached.*
16	Grain red	17
	Grain amber	19
17	Spike somewhat club-shaped	*Tesdouni.*
	Spike tapering toward the tip, or at least not club-shaped	18

18 Spike distinctly flattened; grain long and slender ..... *El Aoudja.*
Spike not perceptibly flattened; grain short and broad ..... *Boghar.*

19 Chaff white 20
Chaff red or slightly brown 24

20 Beards black ..... *Pelissier.*
Beard white or straw-colored 21

21 Spike distinctly flattened 22
Spike barely or not at all flattened 23

22 Spike about 1.5 cm. broad; shoulder of outer glume sharply auriculate; grain long and slender ..... *Nab el Bel.*
Spike about 1.1 cm. broad; shoulder of outer glume slightly or not at all auriculate; grain short and broad ..... *Meskiana.*

23 Beak of keel blunt, about as broad as long ..... *M'Saken.*
Beak of keel sharp, two or three times as long as broad ..... *Medeba.*

24 Beards straw-colored or red 25
Beards black 26

25 Beak of keel passing tip of flowering glume; shoulder of outer glume narrow, slightly auriculate ..... *El Hamra.*
Beak of keel hardly reaching tip of flowering glume; shoulder of outer glume broad, sharply auriculate ..... *Azizi.*

26 Shoulder of outer glume reduced to a slender tooth; chaff often streaked with black ..... *Maroc.*
Shoulder of outer glume broad, deeply auriculate; chaff not streaked with black ..... *Makouwi.*

27 Chaff smooth; beards sparse and weak, glumes often more than 2 cm. long ..... *El Safra.*
Chaff more or less hairy; beards strong; glumes often long but never reaching 2 cm. in length 28

28 Beards nearly or quite black ..... *Caïd Eleuze.*
Beards straw-colored 29

29 Spikes tapering decidedly in the upper half 30
Spike not tapering perceptibly except at extreme tip 31

30 Spike 5 to 7 cm. long; grain dull amber ..... *Zedouni.*
Spike 8 to 10 cm. long; grain very light clear amber ..... *Ouchda.*

31 Spike about 2.2 cm. broad ..... *Aures.*
Spike about 1.5 cm. broad ..... *Adjini.*

AICHA EL BEIDA.

PLATE IV, FIG. 1.

Spike straight or nearly so; chaff smooth, white; grain clear amber; beards white or straw-colored; beak of keel two to four times as long as broad, distinctly passing the flowering glume; spikes about 1.2 cm. broad; spikelets bearing three or four grains.

This variety is grown to some extent on the high plateau of Constantine, near Meskiana, but it has not proved vigorous enough to hold a very important place in general culture there, where popular sentiment demands a wheat with a shorter, more compact head. The derivation of the name is: "Aicha," a term of endearment applied to a woman, and "el Beida," which means "the white."

COURTELLEMENT.

PLATE IV, FIG. 2.

Spike straight or nearly so; chaff smooth, white; grain amber; beards white or straw-colored; beak of keel two to four times as long as broad, scarcely reaching the tip of the flowering glume; spike tapering from base to tip; shoulder of outer glume sharply auriculate.

This variety is from seed sent to Algeria from Syria by Mr. Courtellement, a traveler, from whom it takes its name. It is not widely known nor generally grown in Algeria, but deserves attention from the fact that the beards are somewhat deciduous, readily breaking off as the plant reaches maturity.

FIG. 1. FIG. 2.

DURUM WHEATS: FIG. 1, AICHA EL BEIDA; FIG. 2, COURTELLEMENT.

HELIOTYPE CO., BOSTON.

BELOTURKA. Synonym: Kubanka.

PLATE V, FIG. 1.

Spike straight or nearly so; chaff smooth, white, or nearly so; grain amber; beards white or straw-colored; beak of keel two to four times as long as broad, scarcely reaching the tip of the flowering glume; spike about the same size from base to tip; shoulder of outer glume very slightly auriculate.

This variety is of Russian origin, as the name indicates. It is grown rather extensively in Algeria, but under a great variety of names. It yields fairly well, but the grain is somewhat inferior in quality to that of the best Algerian wheats, and very much inferior to what it is when grown in Russia. It is probably adapted to land much richer in humus than the average Algerian soil.

XERES. Synonym: Puglia.

PLATE V, FIG. 2.

Spike straight or nearly so; chaff smooth, white; grain amber, inclining to red; beards white or straw-colored; beak of keel five to six times as long as broad; shoulder of outer glume broad, not sharply auriculate; grain short and broad.

This wheat is supposed to be of Spanish origin. It is now widely cultivated in all wheat-growing countries bordering on the Mediterranean. Under the name "Puglia," it is one of the best-known wheats of Italy. It is well known commercially and widely cultivated in Algeria, although often under purely local names. For both yield and quality it ranks among the best varieties grown in Algeria.

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG. 1, BELOTURKA; FIG. 2, XERES.

HELIOTYPE CO., BOSTON.

POULOT.

PLATE VI, FIG. 1.

Spike straight or nearly so; chaff smooth, white; grain clear amber; beards white or straw-colored; beak of keel two to four times as long as broad, distinctly passing the tip of the flowering glume; spikes about 1 cm. broad; spikelets bearing two or three grains.

This variety is grown to a limited extent in the southern part of the province of Algiers. It is named after the man on whose property it was found. It is not widely grown in Algeria, and is not commercially known. The grain is very large and of excellent quality.

PAROS. Synonyms: Atelante; Grece volo.

PLATE VI, FIG. 2.

Spike straight or nearly so; chaff smooth, red; grain amber, very slender, and pointed; spike about the same size from base to tip; beards brown, vigorous, and well retained; spikes about 1 cm. broad; spikelets bearing usually two grains; shoulder of outer glume very narrow, slightly auriculate.

This variety was introduced into Algeria from Greece. It is of very good quality, but has never attained a prominent place in general culture. Hairy-chaffed strains of this variety are not uncommon, the variety known as "El Hamra" being probably closely related to this one.

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG. 1, POULOT; FIG 2, PAROS.

HELIOTYPE CO., BOSTON.

BELIOUNI.

PLATE VII, FIG. 1.

Spike straight or nearly so; chaff smooth, red; grain clear amber, rather large; beards brown or black, vigorous, and well retained; spike about 1.2 cm. broad, nearly the same size from base to tip; spikelets bearing three or four grains; shoulder of outer glume broad, sharply auriculate. (See also Pl. II, fig. 1.)

This variety is well known on the high plateau of the province of Constantine in the vicinity of Setif; it is doubtless indigenous to that region. It has a vigorous habit of growth and produces grain of excellent quality.

MEDEAH.

PLATE VII, FIG. 2.

Spike straight or nearly so; chaff smooth, red, inclining to black; grain large but short, clear amber; beards brown or black, inclining to break off as the plant nears maturity; spike tapering decidedly from base to tip.

This variety is doubtless indigenous to Algeria. It takes its name from a town near the center of the province of Algiers, near which it is almost the only variety cultivated. It is known commercially as one of the superior sorts for the manufacture of macaroni. In the western part of the province of Oran, where it has been recently introduced, it matures nearly two weeks in advance of the other varieties cultivated there and yields well, producing grain of excellent quality. It is one of the most prominent varieties in Algeria.

FIG. 1.

FIG. 2.

DURUM WHEATS. · FIG. 1, BELIOUNI; FIG. 2, MEDEAH.

HELIOTYPE CO., BOSTON.

CAÏD DE SIOUF.

PLATE VIII, FIG. 1.

Spike straight or nearly so; chaff smooth, black; grain dull amber, inclining to white; beards black; spike rather small, usually about 6 cm. long.

This variety is the product of selection made by an Arab, "Caïd," whose name it bears. While the grain is of rather large size, neither its quality nor the vigor of the plant is such as to gain for this variety a very large place in general culture in Algeria.

KAHLA. Synonyms: Maraouni; Madona.

PLATE VIII, FIG. 2.

Spike straight or nearly so; chaff black; grain clear reddish amber; beards black; spike about 8 cm. long.

This wheat is grown in Algeria under a wide variety of names and conditions. It is a favorite with the Arabs. The name "Kahla" signifies black, in reference to the color of the chaff, which, however, varies somewhat with the conditions of light and atmospheric moisture. The plant is hardy and vigorous, growing with irrigation in the edge of the Sahara, and without irrigation on the high plateaus. The name "Madona" is attached to a strain of this variety, which is of Grecian origin. This variety has probably a wider distribution in Algeria than any other.

FIG. 1.

FIG. 2.

DURUM WHEATS. FIG. 1, CAID DE SIOUF; FIG. 2, KAHLA.

HELIOTYPE CO., BOSTON.

TRIMENIA.

PLATE IX, FIG. 1.

Spike straight or nearly so; chaff smooth, white; grain small, dull red; spike about 8 mm. broad, the least compact of all the Algerian durums; beak of keel five to six times as long as broad; shoulder of outer glume narrow, distinctly auriculate.

This variety is a native of Sicily, and has not been grown in Algeria except in an experimental way. Its chief value lies in its early maturity, from which it takes its name, "Trimenia" signifying three months. In the countries bordering the Mediterranean on the north this variety is grown with spring planting. The grain closely resembles in appearance the best Russian durums, and the Sicilian wheat is extensively used for making the superior grades of macaroni in Naples and Genoa.

HACHED. Synonym: Chetla.

PLATE IX, FIG. 2.

Spike straight or nearly so; chaff smooth, slightly reddish; grain clear red; spike about 1.1 cm. long; beak of keel three or four times as long as broad; shoulder of outer glume broad, not sharply auriculate.

This variety is one of the most important of the few red-grained kinds cultivated in Algeria, where amber-grained wheats are more generally sought after. It is cultivated chiefly on the higher lands of the province of Constantine, where it is frequently found. It is not of enough importance to find its way into commerce under its own name.

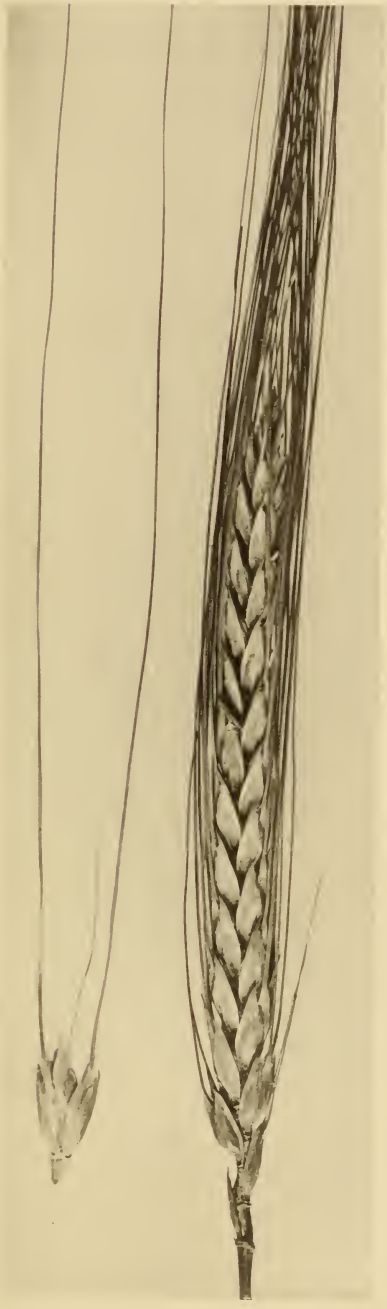

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG. 1, TRIMENIA; FIG. 2, HACHED.

HELIOTYPE CO., BOSTON.

BOGHAR. Synonym: Maroc Rebat.

PLATE X, FIG. 1.

Spike straight or nearly so; chaff more or less hairy; grain red, short and broad; spike gradually tapering toward the tip, but not perceptibly flattened.

This variety is probably of Spanish origin. It has not been cultivated in Algeria except in an experimental way, though the quality of the grain is very good indeed. It is said to be cultivated to some extent in Morocco under the name of "Rebat."

EL AOUDJA. Synonym: Sbaa el Roumia.

PLATE X, FIG. 2.

Spike straight or nearly so; chaff more or less hairy, white; grain red, long, slender, and pointed; spike slightly tapering toward the tip, distinctly flattened.

This variety is extensively cultivated under various names in the mountains of Kabylia, where it does fairly well, even under the adverse conditions of very slovenly culture which often prevail in this locality. The name "Sbaa el Roumia," by which it is often known, means "the finger of a Christian," in reference to the general shape and color of the spike. The form of spike and habit of growth somewhat resemble the "Nab el Bel" or "Richi" wheat. The latter, however, has the grain of a clear amber color, so that no confusion should arise between the two.

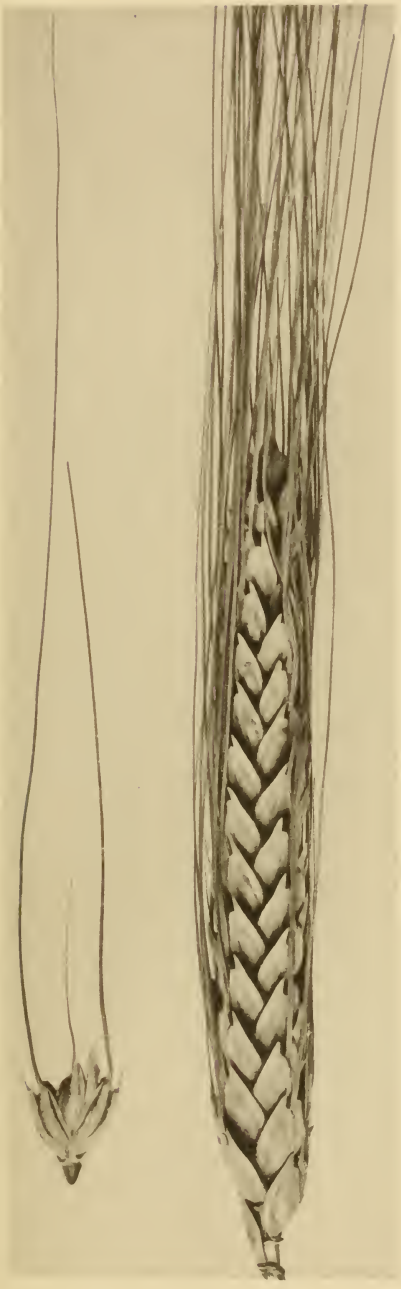

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG. 1, BOGHAR; FIG. 2, EL AOUDJA.

HELIOTYPE CO., BOSTON.

TESDOUNI.

PLATE XI, FIG. 1.

Spike straight or nearly so; chaff hairy, nearly white; grain red; spike somewhat club-shaped.

This is one of the many kinds of wheat cultivated by the Arabs in the Aures Mountains of the province of Constantine, Algeria. The spike is sometimes slightly curved, but the arrangement of the spikelets is not such as to class this variety with those having curved spike and exposed rachis. In general form, however, the spike often closely resembles that of the variety described later under the name "Zedouni;" in fact, the present variety may be considered as a variation from that. It is very vigorous and maintains itself well, even on the thin, poorly cultivated soils of the region where it grows. The grain is large and of excellent quality, but it seldom finds its way into commerce under its true variety name. A wheat closely resembling this and probably of the same variety has been found in Morocco.

M'SAKEN.

PLATE XI, FIG. 2.

Spike straight or nearly so; chaff more or less hairy, nearly or quite white; beards white or straw-colored; spike barely if at all flattened; beak of keel blunt, about as broad as long; grain small, clear amber.

This variety is probably of Tunisian origin and is adapted to very dry conditions. It is, so far as is known, not widely cultivated in Algeria. Its name would indicate that it is considered by the Arabs to be one of the original types of wheat.

FIG. 1.

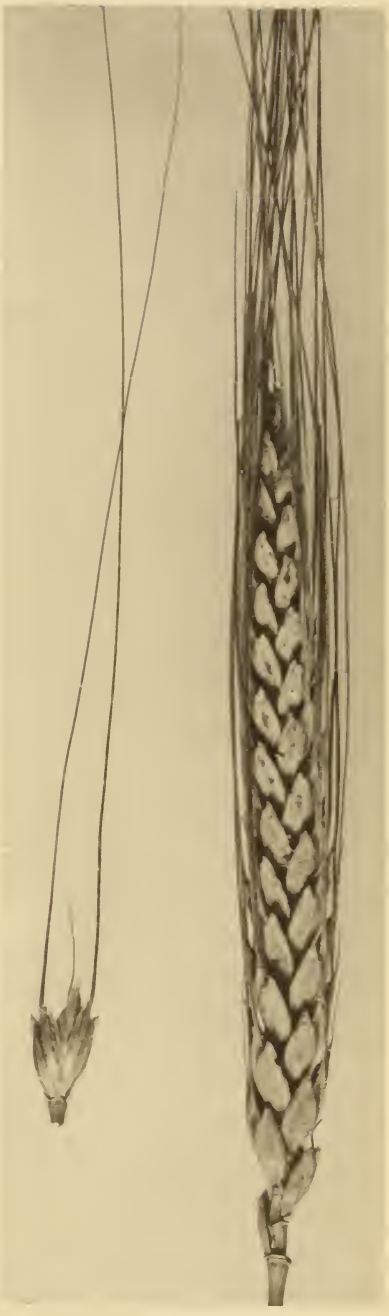

FIG. 2.

DURUM WHEATS: FIG. 1, TESDOUNI; FIG. 2, M'SAKEN.

HELIOTYPE CO., BOSTON.

MEDEBA.

PLATE XII, FIG. 1.

Spike straight or nearly so; chaff hairy, white; grain clear amber, large, blunt; spike barely if at all flattened; beak of keel sharp, two or three times as long as broad; beards white or straw-colored.

This variety is one of the many found in the Aures Mountains of the province of Constantine. The name signifies "humpbacked," in reference to the peculiar shape of the berry. The wheat is not widely known either in culture or commerce, but is a vigorous sort and produces grain of very good quality.

MESKIANA. Synonyms: Djenah au Necar; Abd el Kader.

PLATE XII, FIG. 2.

Spike straight or nearly so; chaff more or less hairy, white; grain clear amber, large, short, and broad; beards white or straw-colored; spike distinctly flattened, about 1.1 cm. broad; shoulder of outer glume slightly or not at all auriculate. (See also Pl. III, fig. 2.)

This variety of wheat takes its name from a town in the province of Constantine, Algeria. It is commonly grown by the Arabs in the Aures Mountains, but under various names, which suggest good qualities for it, although it has not, so far as is known, attracted special attention in either culture or commerce.

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG. 1, MEDEBA; FIG. 2, MESKIANA.

HELIOTYPE CO., BOSTON.

CAÏD ELEUZE.

PLATE XIII, FIG. 1.

Spike more or less curved; rachis nearly or quite exposed on the curved side; chaff more or less hairy, white; beards very strong, nearly or quite black; grain clear amber, very large. (See also Pl. I.)

This variety, which takes its name from an Arab officer, is noticeable chiefly for the large size of its grain. It is grown on the high plateau of the province of Constantine, but has not a wide distribution. It is not known in commerce.

PELISSIER. Synonym: Hebda.

PLATE XIII, FIG. 2.

Spike straight or nearly so; chaff white, hairy, though in some strains nearly or quite smooth; grain dull amber, inclining to white; beards black.

This variety, presumably of Spanish origin, is widely distributed throughout North Africa, where it is grown under many different names. The chief name is taken from a man living near "Ponts des Issers," in the western part of the province of Oran, who did some valuable work in selection to improve the yield of the variety. There is in this variety considerable variation, or else there are several distinct varieties that closely resemble this one in general appearance. The predominant type is as described above, but it is not uncommon to find wheat identical with this except for a smooth chaff. It is difficult to decide whether or not this characteristic is sufficient to make a variety distinction. Pelissier wheat is now attracting attention on account of its superior yielding qualities. It is gaining a considerable place in general culture in the western part of the province of Algiers, and has shown itself to be one of the best yielding and most rust-resisting varieties that have been tried at the botanical experimental station at Rouiba, Algeria.

MOHAMED BEN BACHIR. Synonym: Makouwi.

PLATE XIII, FIG. 2.

This variety so closely resembles the preceding one, except in the color of the chaff, that the same cut may illustrate both. (See also Pl. II, fig. 2.) It is said that the original seed of this plant was brought from Mecca (hence the name "Makouwi") by an Arab, from whom it is named "Mohamed ben Bachir." The latter is much the more common name. The variety is a favorite in the province of Constantine, near Setif, which is one of the largest primary wheat markets in Algeria. The wheat is extensively known both in culture and in commerce.

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG 1, CAID ELEUZE; FIG. 2, PELISSIER.

HELIOTYPE CO., BOSTON.

EL HAMRA. Synonym: Russian.

PLATE XIV, FIG. 1.

Spike straight or nearly so; chaff more or less hairy, red or slightly brown; grain clear amber, slender and pointed; beards straw-colored or red; beak of keel passing tip of flowering glume; shoulder of outer glume narrow, slightly auriculate.

The name of this variety refers to the general color of the spike, signifying "the red." It is probable that some seed of Russian origin has produced a similar variety, which accounts for the synonym. This wheat is widely distributed in Algeria, but is by no means as extensively grown as some of the other sorts. It is easily possible to confuse this variety with "Paros," previously mentioned, which differs from it only in having a smooth chaff. The similarity between the two sorts extends to the shape and color of the grain.

AZIZI.

PLATE XIV, FIG. 2.

Spike straight or nearly so; chaff more or less hairy, red or slightly brown; beards straw-colored or red; grain large, clear amber; beak of keel hardly reaching tip of flowering glume; shoulder of outer glume broad, sharply auriculate.

This variety is said to have been brought into Algeria from Tunis. So far as is known, it has not gained a prominent place in general culture.

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG 1, EL HAMRA; FIG. 2, AZIZI.

HELIOTYPE CO., BOSTON.

MAROC.

PLATE XV, FIG. 1.

Spike straight or nearly so; chaff more or less hairy, red or slightly brown; grain long, pointed, amber inclining to red; beards black; shoulder of outer glume reduced to a slender tooth; chaff often streaked with black.

This variety has been brought into Algeria from Morocco and tried in an experimental way. It has not so far found a place in general culture. It is, however, a distinct type and for that reason retains a place in this list.

OUCHDA.

PLATE XV, FIG. 2.

Spike more or less curved; chaff hairy; beards straw-colored, very strong; glumes often long but never reaching 2 cm. in length; spike tapering decidedly in the upper half, 8 to 10 cm. long; grain very light, clear amber; beards inclining to black.

This is one of the types commonly found in mountainous regions. It is very vigorous and is popular where wheat culture is carried on under adverse conditions. It is supposed to have originated in Morocco, but has been tried to some extent in Algeria.

FIG. 1. FIG. 2.

DURUM WHEATS: FIG. 1, MAROC; FIG. 2, OUCHDA.

ADJINI.

PLATE XVI, FIG. 1.

Spike more or less curved; chaff hairy; beards very strong; glumes well developed, but never reaching 2 cm. in length; spike not tapering perceptibly except at extreme tip, about 1.5 cm. broad; grain large but short, clear amber.

This variety is indigenous to Algeria, where it is widely cultivated in the province of Constantine, especially near Batna. This name is also applied to numerous varieties of wheat cultivated in the vicinity of Constantine. The best quality of this wheat is produced by the Arabs in the Aures Mountains, which is the source of much of the seed for planting the lower lands, where the quality deteriorates after a few generations. The variety is very valuable both for yield and quality of grain.

ZEDOUNI.

PLATE XVI, FIG. 2.

Spike more or less curved; chaff hairy; beards strong; glumes often well developed, but never reaching 2 cm. in length; beards straw-colored, sometimes inclining to blacken, very strong; spike 5 to 7 cm. long, tapering decidedly in the upper half; grain dull amber.

This variety, though not very widely distributed, is well known throughout the province of Constantine, Algeria. It is a sort especially fitted for the thin upland soils of that region. Although not one of the best yielders, the quality of the grain is very good. The name is often applied rather indiscriminately to types of wheat having the spikes curved and compact.

FIG. 1.

FIG. 2.

DURUM WHEATS: FIG. 1, ADJINI; FIG. 2, ZEDOUNI.

HELIOTYPE CO., BOSTON.

AURES.

PLATE XVII, FIG. 1.

Spike more or less curved; chaff hairy; beards strong, straw-colored, glumes often very long, but never reaching 2 cm. in length; spikelets set almost at right angles to the rachis, making the spike about 2.2 cm. broad, nearly the same breadth throughout its length; grain very large, clear amber.

This variety is grown extensively on the lower lands of Algeria from seed obtained from the Aures Mountains, from which it takes its name. It is a very vigorous sort, producing grain of unusual size and very good quality. In the Aures Mountains it is grown under a variety of local names.

MOROCCAIN.

PLATE XVII, FIG. 2.

Spike straight or nearly so; chaff smooth, nearly or quite white; beards white or straw-colored, sometimes rather weak; beak of keel five to six times as long as broad; shoulder of outer glume narrow, sharply auriculate; grain clear amber, long and pointed. (See also Pl. III, fig. 1.)

This wheat, which comes from Morocco, is so far not widely cultivated in Algeria. It is interesting chiefly as showing one of the connecting links between the species *T. durum* and *T. polonicum*. Plants of this variety readily vary toward the type of either species. In both yield and quality of the grain it is considered to be inferior to the regular durum sorts.

FIG. 1. FIG. 2.

DURUM WHEATS: FIG. 1, AURES; FIG. 2, MOROCCAIN.

HELIOTYPE CO., BOSTON.

NAB EL BEL. Synonyms: Richi; Mahmoudi; Gemgoun; Montenotte; El Beliouni; Sbaa el Roumia; El Aoudja.

PLATE XVIII, FIG. 1.

Spike straight, or nearly so; chaff hairy, white; glumes rather long, but never reaching 2 cm. in length; spike distinctly flattened, about 1.5 cm. broad; shoulder of outer glume sharply auriculate; grain clear amber, long and slender, very large, often curved. (See also Pl. III, fig. 2.)

This is probably the most common variety of wheat in eastern Algeria, as its numerous names show. These names for the most part refer to the long, curved shape of the grain, "Nab el Bel" meaning "the eye tooth of a male camel;" "Gemgoun," the "beak of a vulture;" but "Richi," meaning "like a plume," applies to the general shape of the spike. Wheats closely similar to this are widely cultivated in Tunis, Greece, and Egypt. The glumes of this variety are soft and parchment-like, and under a change of conditions the variety may readily sport toward the type of *T. polonicum*. When the variety is kept up, however, by careful selection it stands as one of the most important and best known of the Algerian durums. It is hardy and vigorous, will do well under a wide variety of conditions, and produces grain of extra large size and good quality.

EL SAFRA.

PLATE XVIII, FIG. 2.

Spike more or less curved; chaff smooth, soft and parchment-like; glumes usually more than 2 cm. long; palea about one-half as long as flowering glumes; beards white or straw-colored, sparse and weak; grain amber, very long, slender and pointed.

This variety is, so far as is known, of no great cultural or commercial value. The plants do not seem vigorous and the quality of the grain is not of the highest. The type is used here chiefly to show one of the extremes of variation found in the species *T. durum*. Hybrids between this and other species of wheat have given both interesting and valuable results. This is one of the radical types of wheat and the variation induced by crossing it with other varieties is very great.

○

FIG. 1. FIG. 2.

DURUM WHEATS: FIG. 1, NAB EL BEL: FIG. 2, EL SAFRA.

HELIOTYPE CO., BOSTON.

BULLETINS OF THE BUREAU OF PLANT INDUSTRY.

The Bureau of Plant Industry, which was organized July 1, 1901, includes Vegetable Pathological and Physiological Investigations, Botanical Investigations and Experiments, Grass and Forage Plant Investigations, Pomological Investigations, and Gardens and Grounds, all of which were formerly independent divisions, and also Seed and Plant Introduction, the Arlington Experimental Farm, Tea Investigations and Experiments, and the Congressional Seed Distribution. Beginning with the date of the organization of the Bureau, the independent series of bulletins of the Division of Botany, the last number of which was 29, and also that of each of the other Divisions, were discontinued, and all are now published as one series of the Bureau.

The bulletins already published in this series are:

No. 1. The Relation of Lime and Magnesia to Plant Growth. 1901.
No. 2. Spermatogenesis and Fecundation of Zamia. 1901.
No. 3. Macaroni Wheats. 1901.
No. 4. Range Improvement in Arizona. 1901.
No. 5. Inventory No. 9, Seeds and Plants Imported. 1902.
No. 6. A List of American Varieties of Peppers. 1902.